Department of Energy
Richland Operations Office
P.O. Box 550
Richland, Washington 99352

0074058

07-SED-0381

OCT 0 4 2007

Mr. John P. Martell, Manager
Radioactive Air Emissions Section
State of Washington
Department of Health
Office of Radiation Protection
P.O. Box 47827
Olympia, Washington 98504-7827

Dear Mr. Martell:

TRANSMITTAL OF THE TEN-DAY REPORT ON THE 326 BUILDING Pu-238 SEALED SOURCE LEAK TO THE WASHINGTON STATE DEPARTMENT OF HEALTH

The purpose of this letter is to transmit the "Ten-Day Report on the 326 Building Pu-238 Sealed Source Leak" as requested by Washington Department of Health (WDOH) under the authority of Washington Administrative Code (WAC) 246-247-080(5). This report was previously hand-delivered to WDOH on June 29, 2007 by J. Mathew Barnett of Pacific Northwest National Laboratory (PNNL) to meet the ten day requirement for reporting under WAC 246-247-080(5). PNNL will continue to involve WDOH on known causes and corrective actions. If you have any questions, please contact me, or your staff may contact Pete J. Garcia, Jr., Director, Safety and Engineering Division, on (509) 372-1909.

Sincerely,

Rob G. Hastings, Acting Assistant Manager
for Safety and Engineering

SED:TWF

Enclosure

cc: See Page 2

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EDMC

cc w/encl:
J. M. Barnett, PNNL
G. J. Baron, FHI
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B. J. Dixon, FHI
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E. W. Fordham, WDOH, MSIN B1-42
R. E. Gregory, FHI
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Administrative Record (files: Building 326 stack emissions, Building 329 stack emissions, Near Field Environmental Monitoring, Radiological Public Health and Safety)
Environmental Portal, A3-95, LMSI

Pacific Northwest National Laboratory
Operated by Battelle for the U.S. Department of Energy

July 27, 2007

Pete J. Garcia
Safety and Engineering Division
Richland Operations Office
U.S. Department of Energy
P.O. Box 550
Richland, WA 99352

Dear Mr. Garcia:

WASHINGTON STATE DEPARTMENT OF HEALTH TEN-DAY REPORT ON THE 326 BUILDING LEAKING Pu-238 SOURCE EVENT

Attached for your review and subsequent transmittal to the Washington State Department of Health (WDOH) is the ten-day report requested by the WDOH on the 326 Building Leaking Pu-238 sealed source event. This report was hand-delivered to WDOH on June 29, 2007 to meet the ten day requirement for transmittal under the Washington Administrative Code (WAC) 246-247-080(5). Radioactive air sampling at registered emission points for both the 326 and 329 Buildings to date have shown no Pu-238 was emitted via this pathway to the environment. Also, routine workplace air samples for the 326 Building for June 2007 have shown no elevated airborne radioactive material.

This ten-day report is submitted pursuant to WAC 246-247 "Radiation Protection – Air Emissions," and will need to be submitted to Mr. P. John Martell of the WDOH.

If you have any questions, please contact Mr. Matthew Barnett at 371-7774.

Sincerely,

Roby D. Enge, Director
Environment, Safety, Health and Quality

RDE/JMB/vjg

Attachment

902 Battelle Boulevard • P.O. Box 999 • Richland, WA 99352

Telephone (509) 375-6908 ■ Email Roby.Enge@pnl.gov ■ Fax (509) 375-2933

cc: Theresa L. Aldridge, PNSO
Wayne M. Glines, RL
Marla K. marvin, RL
Mary F. Jarvis, RL
Brenda M. Pangborn, Rl

ATTACHMENT 1

WASHINGTON STATE DEPARTMENT OF HEALTH 10-DAY REPORT ON THE 326 BUILDING LEAKING PU-238 SEALED SOURCE EVENT

Washington State Department of Health 10-Day Report on the 326 Building Leaking Pu-238 Sealed Source Event

Introduction

On Thursday, June 14, 2007, a Pacific Northwest National Laboratory (PNNL) staff member alarmed a hand and shoe counter while exiting a radiological buffer area in the 329 Building, Hanford Site. A follow up survey by a Radiological Control Technician (RCT) confirmed alpha contamination on the staff member. A search for the source of contamination led to the discovery of a leaking Pu-238 sealed source in the 326 Building. Additional surveys of other staff working in the 326 Building lab containing the leaking source discovered a total of three staff with skin contamination (one with positive nasal smears) and a fourth staff member with clothing contamination.

Additional surveys of the staff member's office found alpha contamination on the computer keyboard, desk and chair and on tools in several labs in the Applied Processing Engineering Laboratory (APEL). APEL is located in the city of Richland and is operated by Energy Northwest (ENW). PNNL leases space in the APEL from ENW. Surveys of the affected staff members' personal vehicles identified alpha contamination in three vehicles. Surveys of residences found alpha contamination on clothes, personal effects and a pillow at one home, and on a shirt at a second residence (all of these items were used by the affected PNNL staff members). No contamination involved family members and friends or their personal items.

A contaminated Cs-137 sealed source was also found at the Environmental Molecular Sciences Laboratory (EMSL), Pacific Northwest National Laboratory Site. This sealed source had been cross-contaminated with Pu-238 from the 326 Building and shipped to EMSL. The source was never unpacked or used at EMSL. The shipment was returned to the 326 Building, and there was no contamination spread.

Contamination was also found in the computer repair area of the Information Sciences Building 2 (ISB2), Battelle-Richland North Campus, on a laptop computer and power cord belonging to one of the workers contaminated in the 326 Building. The worker had delivered the computer to ISB2 for repair. There was no spread of contamination from the equipment to the building.

As noted above, contamination or contaminated items were identified at four different facilities. These facilities include the Hanford Site under the Department of Energy (DOE) Office of Environmental Management, the PNNL Site under the DOE Office of Science, the APEL facility leased by the Battelle Memorial Institute and operated by ENW, and the Battelle-Richland North Campus under the Battelle Memorial Institute.

The contamination found on the staff member's face was at 850 dpm / 100 cm^2. The contamination readings found offsite ranged from 280 dpm to 28,000 dpm / 100 cm^2, alpha. The leaking source was recounted on June 16, 2007; the results of the recount show no measurable loss of Pu-238 activity from the source as compared to the September 7, 2006 measurement.

On June 15, 2007, a critique was held. The critique included staff interviews and fact finding efforts. Also on June 15, 2007, the Washington State Department of Health (WDOH) was notified of the leaking Pu-238 source and spread of contamination under Washington Administrative Code (WAC) 246-247-080(5). WDOH requested, by e-mail, a 10-day report under this same regulation on June 20, 2007.

Known Causes

The source of the contamination has been determined to be a leaking 3.9 mCi, Pu-238 sealed source used for instrument testing. On March 5, 2007, a request was made to move the Pu-238 source from storage to a lab space for use in an experiment in the 326 Building, Lab 43C-1. At that time, a periodic leak test was conducted on the source and no contamination was observed. It was determined that this source could be handled using standard sealed source methods as defined in the applicable PNNL RadCon program requirements and sealed source training.

The source was used several times for research and testing during the period from March through June 2007. Sometime in June 2007, the source was compromised and began leaking radioactive material. The exact cause of the source failure has not been determined.

Corrective Actions

Due to the potential for a spread of contamination within the 326 Building, comprehensive surveys were conducted throughout the building and staff surveys were also performed of staff as they left the 326 Building on June 14, 2007. Staff in other buildings that had come in contact with the contaminated staff were also surveyed. No additional staff contaminations were detected. The four affected staff members were decontaminated.

Additionally, follow up surveys were initiated for areas traversed by the affected individuals. Access to the 326 and 329 Buildings and several laboratory spaces at the APEL were restricted as of June 14, 2007 until the planned surveys were completed and the areas surveyed were released by the PNNL Radiological Control Organization. Except for selected areas in the 326 Building, as of June 19, 2007, all other contaminated areas have been decontaminated and normal operations have been restored.

Stack sampling at the 326 and 329 Buildings commenced on June 15, 2007. An initial 72-hour sample was taken at each emission location, and additional sampling at these two locations will continue through July 1, 2007. The initial 72-hour samples were evaluated for Pu-238 and were negative.

Workplace air sampling was conducted during retrieval of the leaking Pu-238 sealed source from Room 43C-1 of the 326 Building on June 16, 2007. The air sample taken in the hallway outside of Room 43C-1 during the retrieval activities had a concentration of ~3% of a DAC. The air sample taken inside of Room 43C-1 upon entry into the room had a concentration of 42% of a DAC. The nearest routine air sampler to Room 43C-1 is located in Room 46C (next door to Room 43C-1). Routine workplace air samples for the month of

June 2007 have been <2% of a DAC for the 326 Building. The DAC value for Pu-238 is 3E-12 μCi / ml as found in 10 CFR Part 835 and WAC 246-221-290.

Actions Taken to Minimize Recurrence

All similar PNNL sources have been taken out of service until safe use of these sources can be established. Additional corrective actions will be identified and taken at the completion of a formal review, currently underway, by an investigation assessment team.

In addition to the above actions, PNNL is reviewing the existing radioactive sealed source program. The following requirements currently apply at PNNL to sealed radioactive sources and were in place prior to this event.

1. When working with Type M (for example, Mylar covered) sealed sources, minimize contact with the Mylar cover, store in appropriate source holders when not in use, and perform precautionary contamination surveys of hand after use.
2. Isolate the source and contact a RCT for a leak test if a source is dropped or otherwise potentially damaged.
3. Do not open or modify any sealed source without the approval of the Radiological Engineer.
4. Maintain positive control of radioactive sources.
5. Be qualified, at a minimum, as a Radiological Worker I.

Response to Similar Manufactured Sources Approved by WDOH on June 9, 2005

On June 9, 2005, WDOH was briefed on a proposed project to utilize PNNL manufactured sources for a Field Demonstration of Radiation Detection Instrumentation. WDOH concurred at the time these sources met the intent of a sealed source. These sources were dispositioned at the end of the project. Project controls included hourly visual inspection during use, response plan in case of Mylar seal puncture, and transportation in 85 gallon over-pack drums. During the project evolution, these sources were monitored and managed to prevent leakage. At the project conclusion, beta emitting sources underwent source material recovery at the 325 Building, and the alpha emitting sources were managed as radioactive waste and disposed. None of these sources were reused and the source involved in the June 14, 2007 incident was not one of the sources.

Conclusions

There are several types of sealed radioactive sources used at PNNL. The differences are in radionuclide, level of activity and construction. The construction of a source determines, and in some cases limits, its ability to be used for various experiments.

The mode of failure is still under investigation and materials science experts are involved in the investigation. Due to the nature of contamination found by surveys (relatively fixed in nature and difficult to remove) and air samples, it is highly unlikely a member of the public would have an inhalation exposure; the more likely exposure route would have been via ingestion after handling the contamination. Assuming contamination found was transferred

from the worker to an object another person touches with their hands, a realistic potential estimated committed effective dose equivalent of less than 1E-03 mrem was determined.

Radioactive air sampling at registered emission points for the 326 and 329 Buildings to date have shown no Pu-238 was emitted via this pathway to the environment. Also, routine workplace air samples for the 326 Building for June 2007 have shown no elevated airborne radioactive material. Sample results are attached.

Several survey plans were prepared and executed. The Summary of Survey Data is attached.

Attachments

1. Dose estimate fact sheet
2. Sealed source survey from March 2007
3. Sealed source re-count from June 2007
4. Survey data summary narrative
5. Summary of survey data
6. Workplace air sample results
7. Radioactive air emissions sample results

Attachment 1

Dose Estimate Fact Sheet

Contamination/Dose Estimates

Realistic potential estimated CEDE is 0 - 1 μrem. The realistic potential estimate scenario assumes the highest level of contamination was transferred from the worker to an object another person touches with their hands. This assumes some fraction of what is on the hands is then ingested.

Worst case estimate CEDE is 10 mrem to the highest exposed individual. The worst case estimate assumes the contaminated worker handled a food item transferring the contamination level to that food item. The food item was then ingested by another individual.

The annual dose limit member of the public is 100 mrem/yr (per 10 CFR 835).

Assumptions:

- Due to the nature of contamination found by surveys (relatively fixed nature / difficult to remove):
  - Inhalation as a route of exposure to a member of the public is highly unlikely.
  - Ingestion is the most likely route of intake for a member of the public.
- Transfer factor is based on mode of ingestion.
  - Realistic potential estimate - Used a transfer factor of 1E-3 for an indirect transfer (from source to hands to GI tract) (NUREG 1717).
  - Worst case - Used a transfer factor of 1 for direct transfer (from source to food or GI tract) (conservative estimate).
- Dose Conversion Factor is from Federal Guidance Report (FGR) 13 for member of the public of 8.44 E-4 rem/nCi.
- Contamination source values:
  - Realistic potential estimate: Used the car seat level of 2,800 dpm (1.3 nCi) probe area as the highest level found on a non-personal object (not on a worker).
  - Worst case estimate: Used the highest level found on the worker, on the pants pocket of 28,000 dpm/probe area (13 nCi).

Attachment 2

Sealed Source Survey From March 2007

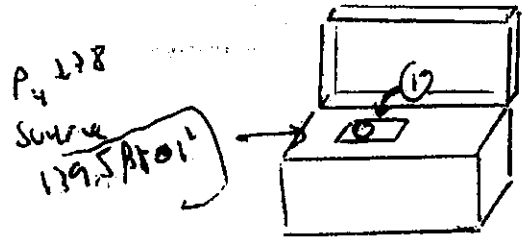
Battelle
The Business of Innovation

Radiological Control Record
Radiological Survey Report

Survey Report Number: 326-07-03-009

Date	Time	Purpose of Survey: [ ] Routine [X] Demand [ ] RCHP
3-5-07	11:30	Survey Pu^{238} source # 1648.

Room(s) / Item(s)	Building	TWD(s)#	RWP Number
30-14C	326	5.5.011	ANL-07-RCT1



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Dose Rate Measurements

Item Description	Inst. #	Distance	OW	CW	CF_{Beta}	mrem/h β	CF_{Gamma}	mrem/h γ	CF_{other}	Smear #
Pu^{238} Source	4	1"	50	7	1	129	1.5	10.5		

Contamination Measurements

#	Location	β-γ	Inst. #	β-γ CF	α	Inst. #	α CF
①	Pu^{238} Source	2MDA	5	2.5	2MDA	5	2.8

Instruments Used 1.____ 2.____ 3.____ 4. LEBA-1465
5. SCLL4-0016 6.____ 7.____ 8.____ 9.____

Signature on this survey form indicates that 1) the instruments above have been source checked in accordance with *RCP-5.5.06, Portable Radiological Survey Instruments*, and 2) RCT actions in the applicable TWDs related to this job have been reviewed in accordance with *RCP-3.4.09, Radiological Job Coverage and Emergency Response*.

γ = mrem/h gamma ### β = mrem/h beta ### η = mrem/h whole body neutron * = mrem/h Contact E = mrem/h Extremity
D# = Direct Survey (dpm/100cm²) M# = Smear (dpm/smear) ## = Air Sample (M) = Technical Smear (dpm/100 cm²) ~(M)~ = Special Smear (dpm/100 cm²)

MDA: MDAs for portable survey instruments are found in RCP-5.5.11, Radiological Surveys, Section 4.
SAC-4 = < ____ dpm α; BC-4 = < ____ dpm β-γ; Ludlum-2929 = < 6.7 dpm β-γ and = < 11 dpm α; Ludlum 2200/G2LE = < ____ dpm/β-γ

RCT Name and Signature	Date	Reviewed By RCT Supervisor	Date
J. Hammack / J. Hammack	3-5-07		3/8/07

Attachment 3

Sealed Source Re-Count From June 2007

Battelle, Pacific Northwest National Laboratory
Richland, WA
Radiochemical Processing Laboratory

filename PuZnSource
09/08/2006
Recount: 06/16/2007

Client: Y. Zhang

Prepared by: LR Greenwood 6/18/07

Technical Review: C. Suderman 6-18-07

Procedure RPG-CMC-450, Gamma Energy Analysis
M&TE: Detector G
Reference date: **09/07/2006**

Sample	Count Date	Measured Activity, millicuries per sample ± 1s counting error			
		Pu-238	Pu-239	Am-241	Am-243
Pu-238 Zn Source	09/07/2006	3.94E+0 ± 5%	3.13E-3 ± 17%	1.91E-3 ± 5%	1.03E-5 ± 4%
Pu-238 Zn Source	06/16/2007	3.87E+0 ± 5%	3.87E-3 ± 18%	2.51E-3 ± 5%	1.09E-5 ± 5%

New Narrative - 06/18/2007

The two counts listed above are statistically equivalent for Pu-238. This data shows no measurable loss of Pu-238 from the source.

The Pu-238 source box was opened in a glovebox and the source was removed and bagged suitably for gamma counting. Visually, the source did not appear to have any significant damage (pictures were taken and sent out separately). The source was gamma counted in a geometry that closely approximated the original gamma count on 09/07/2006. The results were decay corrected to that date for direct comparison to the original count. The comparison shows that the source has not lost any appreciable fraction of the original mass. The increase in the Am-241 may be accounted for by continued ingrowth from Pu-241, which was also seen in the sample but not quantified.

Original Narrative - 09/08/2006

The source was prepared by the electrodeposition of Pu-238 and natural zinc metal together on a stainless steel disk in order to give a continuous distribution of alpha energies from about 0 to 4 MeV. The source, about 5 mm across, has 0.2 mg of Pu-238 and roughly 2 mg of zinc. The zinc metal is not pure; it has oxygen and bound water in it.

The stainless steel disk with the plutonium on it was placed in an aluminum holder provided by the client. The source was then covered with a thin aluminum foil and a stainless steel washer on top. The washer was then glued in place in order to form a sealed source. The source has a tiny hole drilled through the side to allow air to escape from under the aluminum foil when the source is in a vacuum.

The source was gamma counted to determine the source strength. The source is mainly Pu-238, but contains weak activities of Pu-239, Am-241, and Am-243. The counting geometry was only approximately correct, so the absolute uncertainties may be larger than the counting error reported above.

Attachment 4

Survey Data Summary Narrative

Survey Data Summary from Leaking ^{238}Pu Sealed Source Event

Survey data is summarized by the following categories – impacted facilities, non-impacted facilities, personnel, residences, and vehicles. All readings in the following summary are for alpha, beta-gamma readings were non-detectable.

Facilities (Impacted)

Impacted facilities were those where ^{238}Pu contamination was detected on facility surfaces and included 326 Building and APEL.

326 Building

Contamination was found in the following rooms or areas in the 326 Building: Room 43-C (contained leaking ^{238}Pu sealed source), Room 30-C/34-C, Room 14-C, and handrails in east stairwell. Removable contamination levels on the floor, benchtop, and drawer handles in Room 43-C ranged from 700-63,000 dpm/probe area using large area smears and from 350-14,000 dpm/100 cm^2 using technical smears. No direct readings were taken in Room 43-C. Room 30-C/34-C has removable contamination of ~350 dpm/100 cm^2 on the floor in the northeast portion of the room. Direct contamination ranging from 700-1400 dpm/100 cm^2 was found on a cart tire, drill bits, a detector, and a small red pig in Room 30-C/34-C. Several items (i.e., chair, phone, mug, cypher lock, door knob) in Room 14-C had direct contamination readings from 350-2700 dpm/100 cm^2. Isolated spots of fixed contamination (420-2100 dpm/100 cm^2) were detected on the east stairwell railing.

The evening of June 14, 2007 (day ^{238}Pu contamination was discovered), direct surveys of phones, chairs, tool handles, tool box handles, and other general areas were completed in Rooms 1-B, 2-B, 3-B, 4-B, 5-B, 6-B, 7-B, 8-B, 9-B, 10-B, 11-B, 12-B, 13-B, 14-B, 15-B1, 15-B2, 15-B3, 16-B, 18-B, 20-B, 21-B, 22-B, 24-B, 26-B, 27-B, 28-B, 29-B, 30-B, 31-B, 32-B, 33-B, 33-B1, 34-B, 35-B, 36-B, 37-B, 38-B, 39-B, 40-B, 41-B, 42-B, 43-B, 44-B, 45-B, 1-C, 2-C, 3-C, 4-C, 5-C, 6-C, 7-C, 8-C, 9-C, 10-C, 11-C, 15-C, 15-C1, 18-C, 20-C, 21-C, 23-C, and 24-C. No contamination was found in these rooms.

On June 18-19, the entire 326 Building was surveyed in accordance with Survey Plan 326-2007-01 and associated addendums. This included all A Floor rooms and labs (1-A through 33-A except decon shower area), all B Floor rooms and labs (1-B through 51-B4), and all C Floor rooms and labs (1-C through 47-C except restricted access areas), in addition to restrooms and stairwells. No contamination was found in these rooms.

The following rooms are still posted as restricted access: 14-C, 30-C/34-C, 43-C1, and a portion of M6 from the east door to the boundary area around the decontamination shower.

APEL

Contamination was found in the following rooms or areas in APEL: 68 (office), 73 (office), 105 (lab), 202 (lab), 204 (lab), and 214 (lab). Room 68 had removable contamination of ~140

dpm/100 cm^2 on a filing cabinet drawer handle and measurable direct contamination on several office items at levels up to 490 dpm/100 cm^2. Room 73 had fixed contamination (700 dpm/100 cm^2) on the office door knob. Lab 105 had removable contamination of ~800 dpm/100 cm^2 on the benchtop and direct contamination reading of 1400-49,000 dpm/100 cm^2 on the source holder, wrenches, benchtop, and on trash in the trash can. Lab 202 had contaminated items with direct contamination readings from 350-1400 dpm/100 cm^2 and a piece of wire with a reading of 420,000 dpm/100 cm^2. Lab 204 had a pair of pliers with a direct contamination reading of 140 dpm/100 cm^2. Lab 214 had a drill press with a direct reading of 560 dpm/100 cm^2. Hand rails in the east stairwell had several locations of direct contamination reading ~280 dpm/100 cm^2.

Direct and removable contamination surveys of the following areas showed no detectable contamination: first floor hallways, second floor hallway, lunch rooms, restrooms, high bay area, conference room, and chemical storage rooms.

All rooms with contamination were decontaminated and released in accordance with Survey Plan APEL-2007-01.

Facilities (Non-Impacted)

Non-impacted facilities were those where no ^{238}Pu contamination was detected on facility surfaces. These facilities included 329 Building, EMSL, 320 Building, 3760 Building, LSB, and ISB-2. These buildings were surveyed because of the potential of contaminated staff tracking contamination into the facilities.

On June 14, 2007, a contaminated Cs-137 sealed source was found at EMSL. This sealed source had been cross-contaminated with Pu-238 from 326 Building and shipped to EMSL. The source was never unpacked or used in EMSL. The shipment was returned to the 326 Building, and there was no contamination spread.

On Monday, June 18, 2007, contamination was found on a laptop computer (5600 dpm/probe area) and power cord (1400 dpm/probe area) belonging to one of the workers contaminated in 326 Building. Additional surveys performed on June 18 included direct surveys in the following areas: Room 7, a storage cabinet in the Help Desk Area, and the kiosk area. On Tuesday, June 19, 2007, direct surveys were performed in the Help Desk Area, Room 11, Room 13, and Room 19. A total of ten staff were surveyed (three on June 18 and seven on June 19). No contamination was found during the follow-up surveys of the facility and staff.

On June 17 and June 18, 2007, surveys were performed in 329 Building per Survey Plan 329-2007-01. The following rooms and areas were surveyed: 1, 2, 3, 4, 5, 6, 7, 8, 9, 9-1, 15-A, 16-A, 101, 102, 103, 104, 105, 106, 107, 108, 109, 110, 111, 112, 113, 114, 115, 116, 117, 118, 119, 120, 121, 124, 125, 126, 127, 128, 129, 130, 131, 1-C, 2-C, 3-C, 4-C, 5-C, 8-C, 9-C, 10-C, 15-C, 15C-1, 12, 13, 15, 16, 17, 17-A, 6-C, 7-C, 11, 11-C, 12-C, 13-C, 14-C, 15-C, 16-C, 17-C, 18-C, and 19-C.

Surveys performed in non-impacted facilities have no contamination to date.

Personnel

Four PNNL workers were contaminated during the event. Three workers had skin contamination and one worker had personal effect contamination (shoes). One of the three workers with skin contamination had hand contamination only at levels up to 700 dpm/100 cm^2. A second worker had contamination on the hands and neck at levels up to 1050 dpm/100 cm^2. The third worker had facial and hand contamination ranging from 2100-9800 dpm/probe area (4200-19,600 dpm/100 cm^2) and nasal smears up to 23 dpm per smear. None of the other workers had positive nasal smears.

Occupants of several residences were surveyed with no contamination found. In addition, surveys were conducted on approximately 97 PNNL workers from 326 Building, 329 Building, APEL, ISB-2, and various other buildings and no contamination was found.

Residences

A total of five offsite residences were surveyed. Contamination was found at two residences. These were the residences of two workers that were contaminated by the failed ^{238}Pu sealed source. One of these residences was surveyed three times and the other two times. No removable contamination was found at either residence. Direct contamination readings in the one residence ranged from 140-28,000 dpm/100 cm^2. Contaminated items were primarily clothing. The other residence had one shirt contaminated to ~700 dpm/100 cm^2.

Vehicles

A total of 14 vehicles were surveyed. Contamination was found in three vehicles. These vehicles belong to two of the workers contaminated by the failed ^{238}Pu sealed source. No removable contamination was found. Direct contamination readings ranged from 350-2800 dpm/100 cm^2. Contaminated areas included steering wheel, gear shift knob, door handles, and passenger seat.

Attachment 5

Summary of Survey Data

Summary of Survey Data (June 14-22, 2007)

Facility/Personnel/ Residence/Vehicle	Room	Survey Date	Survey Report Number	Removable Alpha Contamination (dpm/100 cm2)	Total Alpha Contamination (dpm/100 cm2)	Comments
320	see comments	6/15/2007	RCHN-07-06-022	<MDA	<MDA	Areas surveyed included lobby floor, hallway floors, stairwell floors, equipment room floor, and desktops/tabletops/keyboards/door handles throughout building.
326	11-A	6/21/2007	326-07-06-064	<MDA	<MDA	Survey of block wall in overhead.
326	11-C	6/20/2007	326-07-06-061	no smears taken	<MDA	Surveyed personal items in office area.
326	14C	6/14/2007	326-07-06-043	<MDA	700 - 2100	Contamination found on chair and cypher lock
326	14C	6/14/2007	326-07-06-047	<MDA	350 - 2700	Contamination found on phone, mug, door knob, arm of chair.
326	15-C	6/20/2007	326-07-06-060	<MDA	<MDA	Surveys performed on sink area, counter top, shelf area, and table.
326	2nd and 3rd floor offices and bathrooms	6/18/2007	326-07-06-067	<MDA	<MDA	Second Floor (B) - surveyed women's bathroom, 22-B, 28-B, 34-B, 37-B, 42-B, 45-B. Third Floor "C" - men's and women's bathroom, janior closet (28-C), 20-C, 22-C, 26-C, 27-C, 29-C, 32-C, 33-C, 35-C, 37-C, 38-C, 39-C, 41-C, 42-C, 44-C, 45-C
326	30-C	6/18/2007	326-07-06-053	350	700 - 1050	Smearable contamination was found on the floor in the northeast side of the room. Direct contamination was found on cart tire, drill bits, drill, and Ortec detector.
326	30-C	6/19/2007	326-07-06-055	no smears taken	1400	Contamination found on small red pig. Pig bagged and take to Room 19-A.
326	43-C1	6/16/2007	326-07-06-039	<MDA	<MDA	outside surfaces of packaged Pu-238 source for shipment to RPL

Summary of Survey Data (June 14-22, 2007)

Facility/Personnel/ Residence/Vehicle	Room	Survey Date	Survey Report Number	Removable Alpha Contamination (dpm/100 cm2)	Total Alpha Contamination (dpm/100 cm2)	Comments
326	43-C1	6/16/2007	326-07-06-040	700 - 63,000 dpm/probe (large area smears); 350 - 14,000 dpm/100 cm2 (tech smears)	none taken	Contamination on floor, drawer handles of cabinet, and benchtop
326	9-A	6/18/2007	326-07-06-052	<MDA	none taken	Survey of lab containing RADACAD sources
326	east stairwell	6/14/2007	326-07-06-046	no smears taken	420 - 2100	Contamination on handrails
326	elevator	6/18/02007	326-07-06-051	<MDA	<MDA	Survey of elevator floor and hallway outside room 9A.
326	Railings (Inside and outside)	6/14/2007	326-07-06-042	<MDA	1400	Contaminated railing in southwest corner stairwell
326	see comments	6/14/2007	326-07-06-045	no smears taken	<MDA	Direct surveys performed in the following rooms - 1-B, 2-B, 3-B, 4-B, 5-B, 6-B, 7-B, 8-B, 9-B, 10-B, 11-B, 12-B, 13-B, 14-B, 15-B1, 15-B2, 15-B3, 16-B, 18-B, 20-B, 21-B, 22-B, 24-B, 26-B, 27-B, 28-B, 29-B, 30-B, 31-B, 32-B, 33-B, 33-B1, 34-B, 35-B, 36-B, 37-B, 38-B, 39-B, 40-B, 41-B, 42-B, 43-B, 44-B, 45-B, 1-C, 2-C, 3-C, 4-C, 5-C, 6-C, 7-C, 8-C, 9-C, 10-C, 11-C, 15-C, 15-C1, 18-C, 20-C, 21-C, 23-C, 24-C.

Summary of Survey Data (June 14-22, 2007)

Facility/Personnel/ Residence/Vehicle	Room	Survey Date	Survey Report Number	Removable Alpha Contamination (dpm/100 cm2)	Total Alpha Contamination (dpm/100 cm2)	Comments
326	see comments	6/19/2007	326-07-06-062	<MDA	<MDA	The following areas were surveyed: 1) B Floor rooms and labs (1-48), 2) C Floor Rooms and labs (1-47), 3) A Floor Rooms (14A-1, 14A-2, 14A-3, 14A-4, 16-A, M1, M2, M4, and restrooms, 4) all hallways, 5) equipment rooms 50-51B4, and 6) labs located in the A floor RBA. The following rooms were posted restricted access - 14-C, 30-C, 43-C1, and portion of M6 from east door to boundary area around decon shower.
326	Stairwells	6/18/2007	326-07-06-069	<MDA	<MDA	
329	14	6/14/2007	326-07-06-044	no smears taken	<MDA	
329	see comments	6/17/2007	329-07-06-049	<MDA	<MDA	Surveys were performed in the following areas: hallways, carpet, interior and exterior door handles, and rooms 1, 2, 3, 4, 5, 6, 7, 8, 9, 9-1, 15-A, 16-A, 101. 102, 103, 104, 105, 106, 107, 108, 109, 110, 111, 112, 113, 114, 116, 117, 118, 119, 120, 121, 124, 125, 126, 127, 128, 129, 130, 131. In addition, the following rooms in the LAI were surveyed: 1-C, 2-C, 3-C, 4-C, 5-C, 8-C, 9-C, 10-C, 15-C, 15C-1, 12, 13, 15, 16, and 17.
329	see comments	6/18/2007	329-07-06-050	<MDA	<MDA	Surveys were performed in the following areas: 17-A, 6-C, 7-C, 11, 11-C, 12-C, 13-C, 14-C, 15-C, 16-C, 17-C, 18-C, 19-C, and all LAI hallways.
3760	106E	6/15/2007	RCHN-07-06-046	no smears taken	<MDA	
3760	lunch room	6/20/2007	RCHN-07-06-077	<MDA	<MDA	

Summary of Survey Data (June 14-22, 2007)

Facility/Personnel/ Residence/Vehicle	Room	Survey Date	Survey Report Number	Removable Alpha Contamination (dpm/100 cm2)	Total Alpha Contamination (dpm/100 cm2)	Comments
APEL	67	6/15/2007	RCHN-07-06-018	no smears taken	<MDA	Room 67 is conference room. Direct readings found on four chairs decayed - was radon.
APEL	68	6/14/2007	RCHN-07-06-031	<MDA	15 - 32 cpm/probe area (105 - 224 dpm/100 cm2)	Contamination on chair and computer keyboard and mouse
APEL	68	6/16/2007	RCHN-07-06-035	140	490	Numerous items were contaminated - highest removable contamination reading was ~140 dpm/100 cm2 on filing cabinet drawer handle and highest direct reading was ~490 dpm/100 cm2
APEL	68	6/17/2007	RCHN-07-06-055	<MDA	<MDA	Results of survey performed after contaminated and potentially contaminated items were removed from the room.
APEL	68	6/18/2007	RCHN-07-06-066	<MDA	<MDA	Surveys of floor, furniture (legs and back), and walls after carpet removal.
APEL	73	6/15/2007	RCHN-07-06-023	<MDA	<MDA	
APEL	73	6/16/2007	RCHN-07-06-033	<MDA	700	Contamination on door knob. Decon to <MDA with tape patch
APEL	102	6/19/2007	RCHN-07-06-079	<MDA	<MDA	Survey of floor, chairs, phone, key boards, door handles, inside drawers, benchtops, samples, glass bell, and vacuum chamber.
APEL	105	6/14/2007	RCHN-07-06-024	<MDA (floor)	1400 - 35,000	Direct contamination found on source holder, wrenches, and benchtop
APEL	105	6/14/2007	RCHN-07-06-031	800	40 cpm/probe (280 dpm/100 cm2)	Removable contamination on benchtop and direct contamination on small tool box
APEL	105	6/14/2007	RCHN-07-06-026	no smears taken	35,000	Contamination was on the source holder.

Summary of Survey Data (June 14-22, 2007)

Facility/Personnel/ Residence/Vehicle	Room	Survey Date	Survey Report Number	Removable Alpha Contamination (dpm/100 cm2)	Total Alpha Contamination (dpm/100 cm2)	Comments
APEL	105	6/17/2007	RCHN-07-06-053	280 - 700	280 - 49,000	Removable contamination was found on floor in northwest corner of the room, on the benchtop, and exterior of trash can. Direct readings found on multiple items, highest reading 49,000 dpm/100 cm2 was found trash in trash can.
APEL	105	6/17/2007	RCHN--07-06-057	<MDA	<MDA	Surveys performed after room decon. Areas surveyed included handles to doors, desks, file cabinets, keyboards, miscellaneous lab equipment, benchtop work areas, and floors.
APEL	105	6/18/2007	RCHN-07-06-069	no smears taken	<MDA	Direct surveys of miscellaneous items in fume hoods. Contaminated worker had not worked in hoods for several weeks.
APEL	107	6/17/2007	RCHN-07-06-056	no smears taken	<MDA	Direct surveys on notebook computer, mouse, laser apparatus, logbook, plastic bags, and metal work surface.
APEL	202	6/14/2007	RCHN-07-06-047	no smears taken	350 - 420,000	Initial survey of room - Piece of wire had 420,000 dpm/100 cm2. Other contaminated items 350 - 1400 dpm/100 cm2
APEL	202	6/17/2007	RCHN-07-06-050	<MDA	<MDA	Post decon survey
APEL	204	6/15/2007	RCHN-07-06-041	<MDA	140	Contamination found on pair of pliers
APEL	214	6/14/2007	RCHN-07-06-026	no smears taken	560	Contamination on drill press.
APEL	216	6/15/2007	RCHN-07-06-041	<MDA	<MDA	Direct surveys of desks, chairs, computers, phones, book, floor, and various items.
APEL	217	6/15/2007	RCHN-07-06-019	<MDA	<MDA	
APEL	202, 204, 206	6/16/2007	RCHN-07-06-034	<MDA	700 - 1400	Contamination found on drill press base and hand file.

Summary of Survey Data (June 14-22, 2007)

Facility/Personnel/ Residence/Vehicle	Room	Survey Date	Survey Report Number	Removable Alpha Contamination (dpm/100 cm2)	Total Alpha Contamination (dpm/100 cm2)	Comments
APEL	202, 204, 217	6/14/2007	RCHN-07-06-032	<MDA	<MDA	
APEL	212/214	6/15/2007	RCHN-07-06-041	<MDA	420	Contamination found on drill press
APEL	Common areas (see comments)	6/17/2007	RCHN-07-06-054	<MDA	<MDA	Large area smears performed on !st and 2nd floor hallways. Sticky roller was used to survey carpeted area on 1st floor. Direct surveys performed on all door knobs.
APEL	Common areas (see comments)	6/14/07-6/15/07	RCHN-07-06-026	<MDA	<MDA	Common areas surveyed included 1st floor hallways, lunch room #55, 2nd floor hallways, and 2nd floor men's room #226.
APEL	east stairwell - hand rails	6/14/2007	RCHN-07-06-030	no smears taken	280	
APEL	east stairwell - hand rails	6/14/07-6/15/07	RCHN-07-06-026	<MDA	<MDA	Handrails deconned from ~280 dpm/100 cm2 to <MDA using water and scratchy pads.
APEL	east stairwell-hand rails	6/14/2007	RCHN-07-06-080	<MDA	<MDA	Survey of hand rails after decon.
APEL	hi-bay, chemical storage rooms, men's restroom	6/15/2007	RCHN-07-06-048	<MDA	<MDA	
APEL	High Bay	6/18/2007	RCHN-07-06-067	<MDA	<MDA	Survey of gas cylinder
APEL	High Bay	6/18/2007	RCHN-07-06-068	<MDA	<MDA	Survey of floor and table surfaces.
APEL	High Bay	6/18/2007	RCHN-07-06-070	<MDA	<MDA	Surveys of burial boxes and bagged waste.
APEL	Lunch room, restrooms	6/14/2007	RCHN-07-06-031	<MDA	none taken	

Summary of Survey Data (June 14-22, 2007)

Facility/Personnel/ Residence/Vehicle	Room	Survey Date	Survey Report Number	Removable Alpha Contamination (dpm/100 cm2)	Total Alpha Contamination (dpm/100 cm2)	Comments
APEL	deck of cards	6/14/2007	RCHN-07-06-051	no smears taken	19-23 cpm/probe area (133-161 dpm/100 cm2); one card was 547 cpm/probe area (3830 dpm/100 cm2)	deck of cards surveyed in RPL
EMSL	1410	6/14/2007	RCHN-07-06-043	140	1400	Contamination on disc source 1088-2-5
EMSL	1410	6/20/2007	RCHN-07-06-076	<MDA	<MDA	Survey of massilinn taped over area.
EMSL	1410 and corridor	6/15/2007	RCHN-07-06-017	<MDA	322	The direct reading of 322 dpm/100 cm2 is believed to be radon and will be resurveyed. Resurveyed on 6/20/07 and determined to be radon (see Survey Report # RCHN-07-06-076)
ISB II	see comments	6/18/2007	RCHN-07-06-065	no smears taken	1400 - 5600	Contamination found on laptop computer (5600 dpm/probe area) and power cord (1400 dpm/probe area) brought to ISB2 for repair. The laptop and cord were stored in a storage cabinet in the Help Desk Area. Surveys were performed on storage cabinet, in Room 7, at two work stations in Room 9, and in kiosk area.
ISB II	see comments	6/19/2007	RCHN-07-06-062	no smears taken	<MDA	Direct surveys were taken in Help Desk Area, Room 11, Room 13, and Room 19.
LSB	OJT Practical Room	6/15/2007	RCHN-07-06-029	<MDA	<MDA	
Personnel	Dave Merrill	6/14/2007	not assigned yet	no smears taken	140	contamination on shoes
Personnel	Dave Merrill	6/14/2007	326-07-06-050	no smears taken	2100	Contamination on left shoe sole.

Summary of Survey Data (June 14-22, 2007)

Facility/Personnel/ Residence/Vehicle	Room	Survey Date	Survey Report Number	Removable Alpha Contamination (dpm/100 cm2)	Total Alpha Contamination (dpm/100 cm2)	Comments
Personnel	Jac Caggiano	6/14/2007	RCHN-07-06-052	no smears taken	280 - 840 dpm/probe area	Personal effects contamination (pants, pillow case) found at residence 330 Spokane St, Kennewick)
Personnel	Jac Caggiano	6/14/2007	326-07-06-048	no smears taken	350 - 1050	Contamination on hands and neck. Personal effects contaminated included wallet, pants, and shirt.
Personnel	Jarrod Crum	6/14/2007	326-07-06-038	3.3 -23 dpm per nasal smear	not applicable	
Personnel	Jarrod Crum	6/15/2007	RCHN-07-06-045	no smears taken	700 dpm/probe area	Contamination on personal effect (shirt)
Personnel	PNNL Staff	6/15/2007	not applicable	no smears taken	<MDA	Surveys were conducted on 97 PNNL workers in 326, 329, APEL, and other facilities.
Personnel	William Sliger	6/14/2007	326-07-06-049	no smears taken	100	contamination on left hand
Personnel	William Sliger	6/14/2007	326-07-06-048	<MDA	not applicable	Nasal smears
Personnel	Dave Merrill	6/14/2007	326-07-06-050	<MDA	not applicable	Nasal smears
Personnel	Jac Caggiano	6/14/2007	326-07-06-048	<MDA	not applicable	Nasal smears
Personnel	Jarrod Crum	6/15/2007	326-07-06-038	no smears taken	2100 - 9800 dpm/probe area (4200 - 19,600 dpm/100 cm2)	Facial and hand contamination
Personnel - 2 Sons of employee	1501 Hains Ave Richland	6/15/2007	RCHN-07-06-038	no smears taken	<MDA	
Residence	330 Spokane St, Kennewick	6/14/2007	RCHN-07-06-027	<MDA	140 - 28,000	Multiple clothing items with contamination. Maximum contamination found on a pair of pants.

Summary of Survey Data (June 14-22, 2007)

Facility/Personnel/ Residence/Vehicle	Room	Survey Date	Survey Report Number	Removable Alpha Contamination (dpm/100 cm2)	Total Alpha Contamination (dpm/100 cm2)	Comments
Residence	330 Spokane St, Kennewick	6/19/2007	RCHN-07-06-064	no smears taken	<MDA	Direct surveys performed on mailbox, surrounding mailboxes, garage door opener inside garage, garage light switch, and door frame.
Residence	Jarrod Crum's residence	6/15/2007	RCHN-07-06-044	<MDA	700	Contamination on shirt.
Residence	2109 Briarwood Ct, Richland	6/16/2007	RCHN-07-06-040	<MDA	<MDA	
Residence	330 Spokane St, Kennewick	6/14/2007	RCHN-07-06-042	<MDA	280 - 840	Highest reading on pair of pants.
Residence	Jarrod Crum's residence	6/14/2007	RCHN-07-06-036	<MDA	<MDA	
Residence - employee ID 3H273	1326 Sacremento	6/15/2007	RCHN-07-06-038	<MDA	<MDA	
Residence - employee ID 3M662	1501 Hains Ave Richland	6/15/2007	RCHN-07-06-038	<MDA	<MDA	
Vehicle	330 Spokane St, Kennewick	6/14/2007	RCHN-07-06-042	<MDA	700	Contamination on steering wheel and gear shift knob
Vehicle - Blue Mazda	-	6/14/2007	326-07-06-044	no smears taken	<MDA	
Vehicle - Dodge van #1	APEL parking lot	6/15/2007	RCHN-07-06-048	<MDA	<MDA	
Vehicle - Dodge van #2	APEL parking lot	6/15/2007	RCHN-07-06-048	<MDA	<MDA	
Vehicle - GMC Truck	300 area parking lot	6/18/2007	326-07-06-068	<MDA	<MDA	

Summary of Survey Data (June 14-22, 2007)

Facility/Personnel/ Residence/Vehicle	Room	Survey Date	Survey Report Number	Removable Alpha Contamination (dpm/100 cm2)	Total Alpha Contamination (dpm/100 cm2)	Comments
Vehicle - Government van license # G43 25195	-	6/16/2007	RCHN-07-06-039	no smears taken	<MDA	
Vehicle - Honda	1501 Hains Ave Richland	6/15/2007	RCHN-07-06-038	<MDA	<MDA	
Vehicle - Jarrod Crum	APEL	6/14/2007	RCHN-07-06-025	no smears taken	350 - 2800	Highest reading on passenger seat
Vehicle - License plate (424-5xx)	1326 Sacremento	6/15/2007	RCHN-07-06-038	<MDA	<MDA	
Vehicle - License plate (548-TXV)	EMSL	6/15/2007	RCHN-07-06-017	no smears taken	<MDA	
Vehicle - mini van	2109 Briarwood Ct, Richland	6/16/2007	RCHN-07-06-040	<MDA	<MDA	
Vehicle - Red GEO	LSB parking lot	6/15/2007	RCHN-07-06-020	<MDA	<MDA	
Vehicle - silver gov. truck at ETB	ETB	6/15/2007	RCHN-07-06-048	<MDA	<MDA	
Vehicle - Subaru license# 876-NPA	APEL parking lot	6/17/2007	RCHN-07-06-059	no smears taken	<MDA	Surveyed front seats, floor mat, pedals,interior of front doors, dashboard

Attachment 6

Workplace Air Sample Results

Air Filter Sample Report

Batch ID:	Job Specfic Air Sample #2 - 200706172152			**Radiological Survey Report Number**	
Batch Number	8,856	**Device:**	WD24982	**Acquisition Date:**	6/17/07 9:52 pm

Efficiency Factors (%)

Alpha:	0.34	**Daily Background**		**MDCR's**		**MDC's**		**Filter Type:** LB-5211 / [illegible]
Beta:	0.47	**Alpha Rate**	0.300	**Alpha**	1.08	**Alpha**	4.237E-013	**Filter Collection Eff.:** 1.0
		Beta Rate	3.10	**Beta**	2.86	**Beta**	8.069E-013	**Filter Transmission Factor:** .8

Alias ID	Carrier #	Sample Vol.	Filter On	Filter Off	Net Alpha CPM	Alpha Concentration	Net Beta CPM	Beta Concentration	Positive
Alpha source	1	150.00	6/16/07 3:20 pm	6/16/07 3:33 pm	9,684.60	3.812E-009	947.90	2.674E-010	30%PuDAC
Beta Source	2	150.00	6/16/07 3:20 pm	6/16/07 3:33 pm	161.60	6.361E-011	22,774.80	6.424E-009	30%PuDAC
blank	3	150.00	6/16/07 3:20 pm	6/16/07 3:33 pm	0.00	<MDC	0.20	< MDC	
326-43c1-initialentry		150.00	6/16/07 3:20 pm	6/16/07 3:33 pm	2.50	9.841E-013	0.60	< MDC	30%PuDAC

	Activity on Filter (ncpm)a	/ Efficiency	x constant	/ Av flow rate (cfm)b	/ PF	= Dac-h
Alpha	2.50	0.3387	0.166	11.54	100	0.0011
Beta/gamma	2.86	0.4727	0.0002	11.54	100	0.0001
					Total DAC-h	0.0011

a) If activity is <MDCR, then use the MDCR in the calculation and express as < value
b) 1cfm=28.32 lpm, 2cfm=57lpm, 5 lpm=0.18cfm

CL RCT Print / Signature: Frank Gonzalez / [signature] Date: 6-18-07

CL Supervisor Signature: [signature] Date: 6/18/07

REV 000912.ELR

TRACKS # 6517

Air Filter Sample Report

8/2007
7:48:58AM

Batch ID: Job Specific sys 1 - 200706172153 **Radiological Survey Report Number**_____

Batch Number 8,857 **Device:** WD28149 **Acquisition Date:** 6/17/07 9:53 pm **Acquisition Time: (minutes)** 10.0

Efficiency Factors (%)

Alpha: 0.34

Beta: 0.47

Daily Background

Alpha Rate 0.200

Beta Rate 3.55

MDCR's

Alpha 0.93

Beta 3.04

MDC's

Alpha 5.353E-014

Beta 1.276E-013

Filter Type: LB-5211 / HD-206 /

Filter Collection Eff.: 1.0

Filter Transmission Factor: .8

Alias ID	Carrier #	Sample Vol.	Filter On	Filter Off	Net Alpha CPM	Alpha Concentration	Net Beta CPM	Beta Concentration	Positive
Alpha Source	1	1,020.00	6/16/07 9:00 am	6/16/07 5:30 pm	1,589.00	9.161E-011	212.05	8.895E-012	>30%PuDAC
Beta Source	2	1,020.00	6/16/07 9:00 am	6/16/07 5:30 pm	3.50	2.018E-013	2,608.35	1.094E-010	>2%PuDAC
Blank	3	1,020.00	6/16/07 9:00 am	6/16/07 5:30 pm	-0.10	<MDC	-0.35	< MDC	
326-43c1-hall	4	1,020.00	6/16/07 9:00 am	6/16/07 5:30 pm	1.60	9.224E-014	6.15	2.580E-013	>2%PuDAC

	Activity on Filter (ncpm)a	/ Efficiency	x constant	/ Av flow rate (cfm)b	/ PF	= Dac-h
Alpha	1.60	0.3401	0.166	2.00	1	.3905
Beta/gamma	6.15	0.4674	0.0002	2.00	1	.0013
					Total DAC-h	.3918

a) If activity is <MDCR, then use the MDCR in the calculation and express as < value
b) 1cfm=28.32 lpm, 2cfm=57lpm, 5 lpm=0.18cfm

CL RCT Print / Signature: Frank Gonzales / [signature] Date: 6-18-07

CL Supervisor Signature: [signature] Date: 6/18/07

REV 000912.ELR

Air Filter Sample Report

6. 2007
10:56:12AM

Batch ID: Job Specific Air Sample #2 - 200706190922 **Radiological Survey Report Number** _____

Batch Number 8,867 **Device:** WD24982 **Acquisition Date:** 6/19/07 9:22 am **Acquisition Time: (minutes)** 10.0

Efficiency Factors (%)

Alpha: 0.34

Beta: 0.47

Daily Background

Alpha Rate 0.400

Beta Rate 2.70

MDCR's

Alpha 1.20

Beta 2.69

MDC's

Alpha 4.728E-013

Beta 7.582E-013

Filter Type: LB-5211 / HD-206/

Filter Collection Eff.: 1.0

Filter Transmission Factor: .8

Alias ID	Carrier #	Sample Vol.	Filter On	Filter Off	Net Alpha CPM	Alpha Concentration	Net Beta CPM	Beta Concentration	Positive
Alpha source	1	150.00	6/16/07 3:20 pm	6/16/07 3:33 pm	9,709.50	3.822E-009	937.30	2.644E-010	30%PuDA(
Beta Source	2	150.00	6/16/07 3:20 pm	6/16/07 3:33 pm	201.20	7.920E-011	22,688.40	6.399E-009	30%PuDA(
blank	3	150.00	6/16/07 3:20 pm	6/16/07 3:33 pm	-0.30	<MDC	0.70	< MDC	
326-43ct-initialentry		150.00	6/16/07 3:20 pm	6/16/07 3:33 pm	3.20	1.260E-012	1.60	< MDC	30%PuDA(

	Activity on Filter (ncpm)a	/ Efficiency	x constant	/ Av flow rate (cfm)b	/ PF	= Dac-h
Alpha	3.20	0.3387	0.166	11.54	100	0.0014
Beta/gamma	2.69	0.4727	0.0002	11.54	100	0.0000
					Total DAC-h	0.0014

a) If activity is <MDCR, then use the MDCR in the calculation and express as < value
b) 1cfm=28.32 lpm, 2cfm=57lpm, 5 lpm=0.18cfm

CL RCT Print / Signature: FRANK GONZALEZ / Frank Gonz **Date:** 6-19-07 **CL Supervisor Signature:** _____ **Date:** 6/19/07

REV 000912.ELR

Battelle

Radiological Control Record

Radiological Survey Report

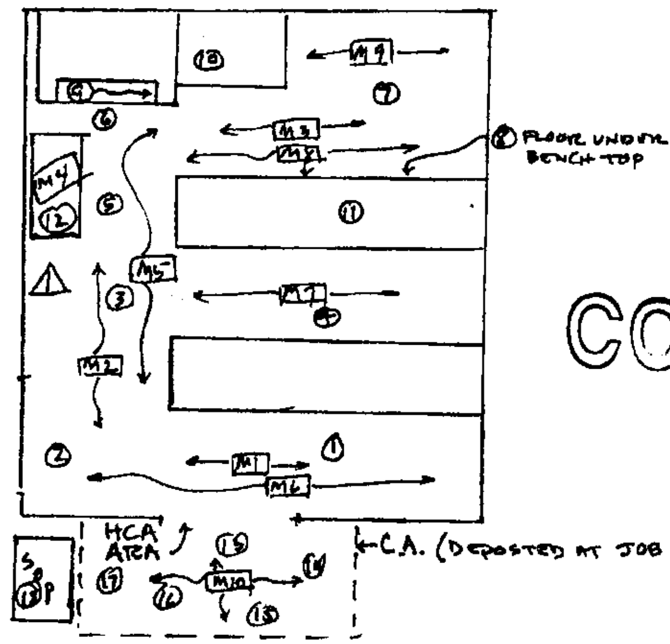
Survey Report Number: 326-07-06-040

Date: 6-16-07 | Time: 1630 | Purpose of Survey: [ ] Routine [X] Demand [ ] RCHP — RETRIEVE & BAG OUT Pu238-1648 SOURCE

Room(s) / Item(s): 43C-1 | Building: 326 | TWD(s)#: 5.5.11 | RWP Number: 326-07-06-0

△ INITIAL β-γ α

>35 MIN



COPY

Dose Rate Measurements

Item Description	Inst. #	Distance	OW	CW	CF Beta	mrem/h β	CF Gamma	mrem/h γ	CF other	Smear #

Contamination Measurements

#	Location	β-γ	Inst. #	β-γ CF	α	Inst. #	α CF
M1	Floor	<MDA	1.2	13	36,400	3	7
M2	"	↓	↓	↓	<MDA	↓	↓
M3	"				1400		
M4	Drawer handles of cabinet				700		
M5	Floor				63,000		
M6	Floor				<MDA		
M7	Floor				1400		
M8	Floor				<MDA		

Instruments Used 1. CMEB3C-0025 2. DTANC-0849 3. ACAN2-0040 4. ICEB3-0305 5. 3CLL4-0017 6. ______ 7. ______ 8. ______ 9. ______

Signature on this survey form indicates that 1) the instruments above have been source checked in accordance with *RCP-5.5.06, Portable Radiological Survey Instruments*, and 2) RCT actions in the applicable TWDs related to this job have been reviewed in accordance with *RCP-3.4.09, Radiological Job Coverage and Emergency Response.*

###γ = mrem/h gamma ### β = mrem/h beta ### η = mrem/h whole body neutron * = mrem/h Contact E = mrem/h Extremity

[D#] = Direct Survey (dpm/100cm²) [M#] = Smear (dpm/smear) △ = Air Sample (#) = Technical Smear (dpm/100 cm²) ~(#)~ = Special Smear (dpm/100 cm²)

<MDA: MDAs for portable survey instruments are found in RCP-5.5.11, Radiological Surveys, Section 4.

SAC-4 = < ______ dpm α; BC-4 = < ______ dpm β-γ; Ludlum-2929 = < 63 dpm β-γ and = < 12 dpm α; Ludlum 2200/G2LE = < ______ dpm/β-γ

RCT Name and Signature: E. J. [signature] | Date: 6-16-07 | Reviewed By RCT Supervisor: [signature] | Date: 6-17-07

76.0/a026e7y0.dot (02/03)

RCP-5.5.11, Exhibit 6

Battelle
The Business of Innovation

Radiological Control Record

Radiological Survey Report Addendum (Readings)

Survey Report Number
326-07-06-040

Instruments Used	1. CMEMC-0025	2. DTIHC-0899	3. ACHN2-0040	4. ICO53-0305
5. SCLL4-0017	6.	7.	8.	9.

Contamination Measurements

#	Location	β-γ	Inst. #	β-γ CF	α	Inst. #	α CF
M9	FLOOR	< MDA	1,2	10	1400	3	7
①→③	FLOOR	↓	↓	↓	< MDA	↓	↓
④	FLOOR				350		
⑤→⑧	FLOOR				< MDA		
⑨	FUME HOOD LEDGE				↓		
⑩	MOUSE				700		
⑪	ON BENCH TOP BY SAMPLE HOLDER				14,000		
⑫	PHONE		↓	↓	< MDA	↓	↓
⑬→⑱	LAYDOWN DUSTIC IN CA. AND STEP OFF PAD	↓	1,2/5	10/2.44	↓	3/5	7/2.83

Dose Rate Measurements

Item Description	Inst. #	Distance	OW	CW	CF_{Beta}	mrem/h β	CF_{Gamma}	mrem/h γ	CF_{other}	Smear #

Remarks:

RCT Name and Signature	Date	Reviewed By RCT Supervisor	Date
E. [illegible] / K. [illegible]	6-16-07	[illegible]	6/17/07

Alias ID	Aliquot Amount	FilterOn	FilterOff	Acquistion Date	Alpha Concentration	Beta Concentration
326-13A-1	20160.03935	5/31/2007 9:00	6/7/2007 9:00	14-Jun-07	-8.75046E-16	2.49376E-14
326-13A-1	20160.03935	6/7/2007 9:00	6/14/2007 9:00	22-Jun-07	1.31804E-15	6.086E-15
326-13A-1	20160.03935	6/14/2007 9:00	6/21/2007 9:00	27-Jun-07	1.0543E-15	1.37758E-14
326-13A-2	20160.03935	5/31/2007 9:00	6/7/2007 9:00	14-Jun-07	8.75046E-16	1.51748E-14
326-13A-2	20160.03935	6/7/2007 9:00	6/14/2007 9:00	22-Jun-07	1.46449E-16	8.18462E-15
326-13A-2	20160.03935	6/14/2007 9:00	6/21/2007 9:00	27-Jun-07	1.0543E-15	1.11518E-14
326-17A-2	20160.03935	5/31/2007 9:00	6/7/2007 9:00	14-Jun-07	2.91682E-16	2.06929E-14
326-17A-2	20160.03935	6/7/2007 9:00	6/14/2007 9:00	22-Jun-07	2.48964E-15	9.86352E-15
326-17A-2	20160.03935	6/14/2007 9:00	6/21/2007 9:00	27-Jun-07	5.27151E-15	1.27262E-14
326-17A-3	20160.03935	5/31/2007 9:00	6/7/2007 9:00	14-Jun-07	1.45841E-15	2.06929E-14
326-17A-3	20160.03935	6/7/2007 9:00	6/14/2007 9:00	22-Jun-07	1.31804E-15	9.44379E-15
326-17A-3	20160.03935	6/14/2007 9:00	6/21/2007 9:00	27-Jun-07	-3.51434E-16	1.16766E-14
326-2A-1	20160.03935	5/31/2007 9:00	6/7/2007 9:00	14-Jun-07	-2.91682E-16	1.39014E-14
326-2A-1	20160.03935	6/7/2007 9:00	6/14/2007 9:00	22-Jun-07	-4.39348E-16	4.4071E-15
326-2A-1	20160.03935	6/14/2007 9:00	6/21/2007 9:00	27-Jun-07	1.75717E-15	7.47827E-15
326-2A-2	20160.03935	5/31/2007 9:00	6/7/2007 9:00	14-Jun-07	8.75046E-16	1.9844E-14
326-2A-2	20160.03935	6/7/2007 9:00	6/14/2007 9:00	22-Jun-07	-4.39348E-16	6.086E-15
326-2A-2	20160.03935	6/14/2007 9:00	6/21/2007 9:00	27-Jun-07	3.1629E-15	1.16766E-14
326-2A-3	20160.03935	5/31/2007 9:00	6/7/2007 9:00	14-Jun-07	2.91682E-16	1.39014E-14
326-2A-3	20160.03935	6/7/2007 9:00	6/14/2007 9:00	22-Jun-07	1.46449E-16	2.09862E-16
326-2A-3	20160.03935	6/14/2007 9:00	6/21/2007 9:00	27-Jun-07	-1.0543E-15	6.42869E-15
326-5A-1	20160.03935	5/31/2007 9:00	6/7/2007 9:00	14-Jun-07	-2.91682E-16	1.64482E-14
326-5A-1	20160.03935	6/7/2007 9:00	6/14/2007 9:00	22-Jun-07	7.32247E-16	5.24655E-15
326-5A-1	20160.03935	6/14/2007 9:00	6/21/2007 9:00	27-Jun-07	3.51434E-16	8.52785E-15
326-5A-2	20160.03935	5/31/2007 9:00	6/7/2007 9:00	14-Jun-07	8.75046E-16	1.81461E-14
326-5A-2	20160.03935	6/7/2007 9:00	6/14/2007 9:00	22-Jun-07	7.32247E-16	5.66628E-15
326-5A-2	20160.03935	6/14/2007 9:00	6/21/2007 9:00	27-Jun-07	-1.0543E-15	8.52785E-15

Alias ID	quot Amou	FilterOn	FilterOff	quistion Da	Alpha Concentration	Beta Concentration
300-A-326						
27A 300-A-326	60780.12	5/15/2007 8:30	6/5/2007 11:00	12-Jun-07	1.40284E-15	1.14745E-14
27A 300-A-326	20220.04	6/5/2007 11:00	6/12/2007 11:30	19-Jun-07	-5.84059E-16	6.48642E-15
27A 300-A-326	23280.05	6/12/2007 11:30	6/20/2007 13:30	26-Jun-07	0	7.27133E-15
36B 300-A-326	17070.03	5/30/2007 12:30	6/5/2007 10:45	12-Jun-07	8.61205E-16	2.78226E-14
36B 300-A-326	20250.04	6/5/2007 10:45	6/12/2007 11:30	19-Jun-07	1.74958E-15	5.22323E-15
36B 300-A-326	23280.05	6/12/2007 11:30	6/20/2007 13:30	26-Jun-07	6.08669E-16	9.08916E-15
46C 300-A-326	43020.08	5/21/2007 12:30	6/5/2007 11:00	12-Jun-07	-4.78407E-16	1.32279E-14
46C 300-A-326	19980.04	6/5/2007 11:00	6/12/2007 9:30	19-Jun-07	-5.91075E-16	8.25836E-15
46C	11460.02	6/12/2007 9:30	6/16/2007 9:00	26-Jun-07	2.47292E-15	1.47711E-14

Attachment 7

Radioactive Air Emissions Sample Results

Battelle / Pacific Northwest National Laboratory
Radiochemical Processing Laboratory (325 Building)
Radiochemical Processing Group

PNNL Project Number: 90008
Work Package Number: F84111
Technical Procedure: RPG-CMC-4001/408
ASR 7945

ABFiltersV1.xls 20-Jun-07
Rev. 1
2/18/04

LB4100/W Low Background Alpha/Beta Counting System

Bkg Count Time = 500 min

Detector Information for 2-inch stainless steel dishes with 47mm filter:

Detector	Alpha Efficiency Eff.	+/-	Beta Efficiency Eff.	+/-	Background (cpm) Alpha	Beta	Instrument Control Alpha	Beta	In Control?	Variance Alpha	Beta	MDA (pCi) Alpha	Beta	Bckgd (pCi) Alpha	Beta
A3	0.371	0.0050	0.563	0.018	0.028	1.23	28.36	55.44	Yes	1.8E-4	8.2E-4	0.22	0.94	0.034	0.98
B4	0.366	0.0050	0.555	0.006	0.044	1.40	34.01	56.80	Yes	1.8E-4	1.1E-4	0.28	1.02	0.054	1.14

L R Greenwood 6-20-07
Technical Reviewer/Date

Kathie Thomas 6-20-07
Analyst/Date

Sample Id.	Tracking No.	Cr.	alpha Ch. 0	beta Ch. 1	Time, min.	Date/Time Counted	Alpha pCi/ sample	Alpha +/-2 s	Alpha Lc,pCi	Alpha >,< Lc	Beta pCi/ sample	Beta +/-2 s	Beta Lc,pCi	Beta >,< Lc	Sample Point	Beginning Date/Time	Ending Date/Time	Flow Rate scfm Start	Flow Rate scfm End
07-01234	1F20	A3	445	1186	10	6/19/07 11:42:00	53.97	5.33	0.11	>Lc	93.94	7.72	0.47	>Lc					
07-01235	1F3D	B4	3	16	10	6/19/07 11:42:00	0.31	0.46	0.14	>Lc	0.16	0.89	0.51	<Lc					

Emp18r0.x07

Pacific Northwest Laboratory
Radiochemistry Group-325 Bldg.

Filename: r:/radchem/sircomp/pnnl/emps2r0.x06 Rev. 0
Project No.: 90008
WP# F84111

print date 6/22/2007
Report Date 6/20/2005

Priority Samples

ASR 7945

C Sidersky 6-22-07
Technical Reviewer/Date

Analyst/Date 6-22-07

LAB_SAMP_ID		EMP_TRACK_NO	SAMPE_POINT_ID	CON_ID	pCi/ sample	UNITS	Q	T_ERROR	C_ERROR	Lc,pCi	METHOD	LAB_CODE		TIME_ON	TIME_OFF	TIME_COUNT	TIME_REPORT	COMMENTS
07-1234	F	1F20	ESP-326-01-S	Pu-239/240	0.007	pCi/s	<Lc	0.007	0.007	0.011	COMP1	PNNL_ACL	P			06/19/2007 16:40:00	6/20/2007	
07-1234	F	1F20	ESP-326-01-S	Pu-238	-0.014	pCi/s	<Lc	0.006	0.006	0.013	COMP1	PNNL_ACL	P			06/19/2007 16:40:00	6/20/2007	
07-1235	F	1F3D	ESP-329-01-S	Pu-239/240	-0.005	pCi/s	<Lc	0.003	0.003	0.007	COMP1	PNNL_ACL	P			06/19/2007 16:40:00	6/20/2007	
07-1235	F	1F3D	ESP-329-01-S	Pu-238	-0.002	pCi/s	<Lc	0.005	0.005	0.008	COMP1	PNNL_ACL	P			06/19/2007 16:40:00	6/20/2007	

Battelle, Pacific Northwest National Laboratory
Richland, WA
Radiochemical Processing Laboratory

filename 07-1234
6/20/2007

Client: M. Barnett
ASR 7945

Prepared by: [signature] 6.22.07

Concur: C Soderquist 6.22.07

Procedures: PNL-ALO-4000, Analysis of composited air filters
RPG-CMC-496, Coprecipitation mounting for alpha spectrometry
RPG-CMC-422, Alpha spectrometry

Reference date June 20, 2007

		Measured Activity, pCi per air filter ± 1s counting error							
Sample	lab ID	**U-234**	±	**U-238**	±	**Pu-238 + Am-241**	±	**Pu-239+240**	±
ESP-326-01-S 1F20	07-1234	**0.017**	**0.006**	**0.004**	**0.003**	**-0.014**	**0.006**	**0.007**	**0.007**
ESP-329-01-S 1F3D	07-1235	**0.002**	**0.002**	**0.001**	**0.003**	**-0.002**	**0.005**	**-0.005**	**0.003**
Reagent spike 1		--		--		--		93%	
Reagent spike 2		--		--		--		90%	
Versapore filter blank		0.006	± 0.004	0.001	± 0.002	0.000	± 0.003	-0.003	± 0.004
Reagent blank		0.000	± 0.003	-0.001	± 0.002	-0.005	± 0.003	-0.002	± 0.004

These two air filters were receive at the RPL on June 19, 2007 and were immediately counted for gross alpha. After the gross alpha count was done, the filters were dissolved in nitric acid, then mounted for alpha spectrometry by coprecipitation. This process will measure any alpha emitting actinide present in the air filters. No actinides were found in either filter, other than a trace of U-234 in sample ESP-326-01-S.

Essentially all the alpha activity originally measured in these two filters is from radon daughters. Plutonium-238 is not detectable in either air filter. Each spike was made with 25 dpm of Pu-239.

Pacific Northwest National Laboratory
Radiochemical Processing Group

LB4100/W Low Background Alpha/Beta Counting System

PNNL Project Number: 90008
Work Package Number: F84111
Technical Procedure: RPG-CMC-4001/408
ASR 7945

LR Greenwood 6.20.07
Technical Reviewer/Date
Kathi Thomas 6.20.07
Analyst/Date

LAB_SAMP_ID		EMP_TRACK_NO	SAMPLE_POINT_ID	CON_ID	VALUE_RPT	UNITS	Q	T_ERROR	C_ERROR	Lc,pCi	METHOD	LAB_CODE		TIME_ON	TIME_OFF	TIME_COUNT	TIME_REPORT	COMMENTS
07-01234	F	1F20		Alpha	53.97	pCi/s	>Lc	5.33	5.12	0.11	GA1	PNNL_ACL	N			6/19/07 11:42:00	6/20/2007	Activity greater than Lc
07-01235	F	1F3D		Alpha	0.31	pCi/s	>Lc	0.46	0.46	0.14	GA1	PNNL_ACL	N			6/19/07 11:42:00	6/20/2007	Activity greater than Lc
07-01234	F	1F20		Beta	93.94	pCi/s	>Lc	7.72	5.54	0.47	GB1	PNNL_ACL	N			6/19/07 11:42:00	6/20/2007	Activity greater than Lc
07-01235	F	1F3D		Beta	0.16	pCi/s	<Lc	0.89	0.89	0.51	GB1	PNNL_ACL	N			6/19/07 11:42:00	6/20/2007	

Department of Energy
Richland Operations Office
P.O. Box 550
Richland, Washington 99352

XX-RCA-XXX

Mr. P. John Martell, Manager
Radioactive Air Emissions Section
State of Washington
Department of Health
P.O. Box 47827
Olympia, Washington 98504-7827

Dear Mr. Martell:

WASHINGTON STATE DEPARTMENT OF HEALTH 10-DAY REPORT ON THE 326 BUILDING LEAKING PU-238 SEALED SOURCE EVENT

Enclosed is the State requested 10-day report on the 326 Building leaking Pu-238 sealed source event. This report was requested by the Washington Department of Health on June 20, 2007 and originally hand-delivered to WDOH on June 29, 2007 to meet the 10 day requirement for transmittal under the Washington Administrative Code (WAC) 246-247-080(5). Radioactive air sampling at registered emission points for the 326 and 329 Building to date have shown no Pu-238 was emitted via this pathway to the environment. Also, routine workplace air samples for the 326 Building for June 2007 have shown no elevated airborne radioactive material.

If you have any questions or require additional information regarding this submittal, please contact Mary Jarvis of my staff on (509) 376-2256.

Sincerely,

Pete J. Garcia, Director

SED:MFJ

Enclosure

cc w/encl: J. M. Barnett, PNNL
L. J. Brandon, PNNL
G. Bohnee, NPT

S. Harris, CTUIR
A.K. Ikenberry, PNNL
R. Jim, YN
J. Van Pelt, CTUIR
Environmental Portal, LMSI

bcc: T.L. Aldridge, PNSO, w/encl.
M.F. Jarvis, RCA, w/encl.
M. K. Marvin, OCC, w/encl.
RCA Official File: 326 Building, w/encl.
AMI Rdg File
RCA Rdg File